

## **Remarks**

Claim 7 is pending. Favorable reconsideration is respectfully requested. Claim 7 stands rejected.

In view of the restriction requirement, the non-elected claims have been cancelled. Per the suggestion of the Examiner, claim 7 has been amended to incorporate the limitations of claim 1.

Claim 7 has been rejected under 35 U.S.C. § 102(b) over Barthel et al. U.S. Patent 5,686,054 (“*Barthel*”) and under 35 U.S.C. § 102(b) over Tojo et al. U.S. Patent 5,278,204 (“*Tojo*”). Both these rejections are traversed.

For rejections based on 35 U.S.C. § 102(b) the standard is “strict identity”, and thus cases involving anticipation are “quite rare”. *Trintec Industries, Inc. v. TOP U.S.A. Corp.*, 295 F3d 1292 (Fed. Cir. 2002). Moreover, for claims containing numerical values, whether individually or as endpoints of a range, the actual individual value, an actual endpoint of a range, or a distinct value squarely within the claimed range must be identically disclosed. *Atofina v. Great Lakes Chemical Corp.*, 78 USPQ 2d 1417 (Fed. Cir. 2006).

In *Atofina*, gas phase fluorination of methylene chloride with HF was claimed. The claim at issue was a process claim which contained three distinct ranges: a temperature range of 330°C to 450°C; an oxygen to methylene chloride molar ratio of 0.1 to 5.0 percent; and a contact time of 0.01 to 10 seconds. With respect to the latter, the alleged anticipatory reference was silent, and the Federal Circuit had no hesitancy in indicating that there was no anticipation of that contact time range either literally or by inherency. The other two ranges were carefully reviewed by the Court and compared with the ranges in the reference. The Table below might be helpful in understanding the Court’s holding.

Patent Claimed Range	JP Reference Disclosure		
	broadest	preferred	example
330 - 450°C	100 - 500°C	150 - 350°C	none within 330 - 450°
0.1 - 5.0 mol ratio O <sub>2</sub> /CH <sub>2</sub> Cl <sub>2</sub>	0.001 - 1	none	none within 0.1 - 5.0

Note that the claimed temperature range is completely within the references broad range of 100 - 500°C, and even overlaps the preferred range. The Court concluded that there was no anticipation, since neither endpoint of the claimed range was disclosed by the reference, and there was no actual example within the claimed range.<sup>1</sup>

The same was true for the O<sub>2</sub>/CH<sub>2</sub>Cl<sub>2</sub> mol ratio. The claimed range was not disclosed. While there was an overlap between the claimed range and the range disclosed by the reference, there were no identical endpoints, nor was any actual example within the claimed range. Thus, there was no anticipation.

Also, when a claim contains a combination of individual values or ranges, each of these must be identically disclosed in the same embodiment or composition, not merely being present individually in separate portions of the specification. *Northern Telecom Inv. v. Datapoint Corp.*, 15 USPQ 2d 1321, 1323, (Fed. Cir. 1990); *cert. den.* 498 US 920 (1990).

Finally, the teachings of a reference must be viewed as a whole, and not in isolation. *In re Fritch*, 23 USPQ 2d 1780 (Fed. Cir. 1992).

The claimed invention is a partly hydrophobic silica having all of the following characteristics:

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<sup>1</sup> The Court acknowledges that an actual example (species) within the claimed range or an identical endpoint (also a species), would have anticipated.

- 1) a contact angle in air for water  $< 180^\circ$ ;
- 2) a degree of coverage  $\tau$  of  $1\% < \tau < 50\%$ ;
- 3) a density of surface silanol groups between 0.9 and 1.7 SiOH/nm<sup>2</sup>;
- 4) a carbon content greater than 0 and less than 2.0% by weight; and
- 5) a methanol number  $< 30$ .

The silica is prepared by a process of silylating silica particles with an amount of silylating agent sufficient to produce particles with the above-identified characteristics, this amount bounded at the high and low ends by from 0.015 to 0.15 mmol/g of silylating agent for each 100 m<sup>2</sup>/g of surface area.

Neither *Barthel* nor *Tojo* disclose any contact angle. Neither *Barthel* nor *Tojo* disclose any surface coverage  $\tau$ . Neither *Barthel* nor *Tojo* disclose any surface silanol density between 0.9 and 1.7 (*Barthel* discloses a value of 0). Neither *Barthel* nor *Tojo* disclose the range of carbon content of greater than 0 to less than 2.0 weight percent. Neither *Barthel* nor *Tojo* disclose a methanol number less than 30 (*Barthel* requires a methanol number greater than or equal to 50, preferably higher). It is clear that neither reference anticipates through its literal disclosure. Please refer to the *Atofina* case cited earlier.

Thus, if anticipation is urged, it may only be based on principles of inherency. However, as indicated in the prior response, inherency cannot be supported.

In rejections based on inherency, the inherency must be certain, *Ex parte McQueen*, 123 USPQ 37 (POBA 1958), *Ex parte Cyba*, 155 USPQ 756 (POBA 1966); and must be a necessary result, and not merely a possible result. *Ex parte Keith*, 154 USPQ 320 (POBA 1966). Recent Federal Circuit cases have re-echoed these principles, requiring that missing descriptive material be “necessarily present” and not merely “probably” or “possibly” present, *In re Robertson*, 49 USPQ2d 1949 (Fed. Cir. 1999), and must meet a “strict identity test” for anticipation. *Trintec Industries, Inc. v. Top-U.S.A. Corporation*, 63 USPQ2d 1597 (Fed. Cir. 2002).

The silicas claimed are partly hydrophobic. However, they are not completely hydrophobic. They must, for example, have a methanol number less than 30. Some preferred silicas have a methanol number of zero. Although these silicas have been silylated and are thus partly hydrophobic, they are still completely water wettable, even without the addition of methanol. When added to water, the particles sink and are dispersed, in contrast to the particles of *Barthel*, for example, which float and cannot be dispersed. This is accomplished in the present invention by use of a very limited amount of silylating agent, 0.015 to 0.15 mmol/100 m<sup>2</sup>/g of surface area. However, not every amount of silylating agent in this range will be useful for a particular silica, because the concentration of surface silanol groups varies greatly with the method of preparation, and silicas have widely varying surface areas and particle sizes. For example, fumed silica produced at very high temperatures in the burner have less surface silanol content than silicas prepared in the same burner with the same silica precursor, but at lower temperature. Moreover, silicas with greater surface area always have greater total surface silanol content as compared to compositionally identical silicas with lower surface area. The range of 0.015 to 0.15 mmol silylating agent covers the range which is useful for silicas of both high and low surface silanol content and small and large BET surface areas. However, if the concentration of silanol groups is low, surface area small, and the silylating agent is towards the high end of the process parameter, an apolar silica with a methanol number greater than 30 will be obtained. Thus, while the silylating agent concentration in the range of 0.015 - 0.15 mmol./100m<sup>2</sup>/g is a necessary condition for preparing the claimed silicas, it is not a sufficient condition. The silica must still meet the enumerated physical property requirements 1 - 5 previously listed.

Barthel discloses only highly apolar silica. According to *Barthel*, no surface silanol groups are detectable, and the methanol number is greater than 50, preferably greater than 65 and more preferably greater than 75. The Examiner states that the process of *Barthel* is the same as Applicants and must produce the same results. However, the process is not the same and factually produces entirely different results. *Barthel* teaches use of silylating agent in amounts of 2 to 100 parts by weight per 100 parts silica. However, Applicants require, first, not parts by weight, but mmols/g for each 100 m<sup>2</sup>/g of surface area, an entirely different

and unrelated ratio. The range of *Barthel* is not related to surface area at all. Expressed in moles (calculated as his preferred  $(\text{CH}_3)_2\text{SiCl}_2$ ), his range is 0.155 mmol/g of silica to 775 mmol/g of silica, with no dependency upon surface area whatsoever. The reason for *Barthel's* extremely large range of silylating agent is that his process may start with untreated pyrogenic (fumed) silica (moderate surface silanol content), precipitated silica (from aqueous sols; high surface silanol content), or already hydrophobic silicas which are then completely silylated in *Barthel's* process. See, e.g. column 4, lines 1 - 11. Each of these different starting material silicas requires a different minimal amount of silylating agent to produce *Barthel's* highly apolar silicas with no remaining silanol groups.

Thus, if already hydrophobic silicas are employed, the additional amount of silylating agent to fully hydrophobize may be at the lower end of the range, whereas very high surface area precipitated silica may require an amount of silylating agent near the high end of the range. Regardless of the amount of silylating agent, the silica of *Barthel* must still meet his requirement of being highly apolar, with virtually no silanol groups remaining. As *Barthel* states:

One object of the present invention is the effective elimination of the silanol groups on the silica surface, that is, the complete silylation of the silica, since these silanol groups in polar systems, destabilize the three-dimensional particle network which is necessary for thickening and thixotropy.

*Barthel* at column 1, lines 44 - 48 (emphasis added). Thus, *Barthel* selects amounts of silylating agents which completely eliminate silanol groups.

*Barthel* discloses surface areas ranging from 25 m<sup>2</sup>/g to an unbounded upper limit, preferably 400 m<sup>2</sup>/g. The amount of silylating agent employed by *Barthel* for any given silica must be that which produces his highly apolar silica. Lower amounts, even though within his broad disclosed range, are not useful, as they will not result in complete silylation which *Barthel* requires.



The characteristics of *Barthel's* silica is set forth in column 8, beginning at line 58:

The highly apolar silica according to the invention has, per 100 m<sup>2</sup>/g specific surface area (measured by the BET method in accordance with DIN 66131 and 66132), a carbon content of at least 1 % by weight, preferably at least 1.5 % by weight and more preferably at least 2.0 % by weight. No isolated silanol groups can be detected at a wave number of 3750 cm<sup>-1</sup> on the silica by means of IR spectroscopy. Even after prolonged intense contact with water, for example shaking, the silica has no water-wettable fractions. The silica exhibits a methanol number (Appendix III) of greater than or equal to 50, preferably greater than 65 and more preferably greater than 75.

*Barthel*, column 8, line 58 to column 9, line 2. Thus, like the present invention, *Barthel* discloses a range of silylating agent which may be useful, but only specific silylating agent amounts which result in his inventive silica are the amounts actually used, and are dependent on the nature of the raw material, which may already have been substantially hydrophobicized. The Table below compares *Barthel's* and Applicants' products side-by-side.

Subject Invention		Barthel
Methanol #	< 30	≥ 50, pref. 65,75
Surface Silanol Groups	0.9 - 1.7	0
Water Wettable Fractions?	Yes	No

For inherency, every limitation of the prior art must necessarily result in the claimed invention. It is clear that *Barthel* does not meet this requirement. There can be no rejection over *Barthel* based on inherency.

*Tojo* is similar to *Barthel* in that *Tojo* does not disclose any treatment amount in mmol/g for each 100m<sup>2</sup>/g surface area. At column 5, lines 16 - 20, amounts of silane from

0.1 to 5% by weight are disclosed, and in the previous paragraph, BET surface areas of 50 - 400 m<sup>2</sup>/g. In that paragraph, *Tojo* indicates that surface silanol groups are blocked.

*Tojo* does not even discuss any of the claim limitations of contact angle, coverage degree, surface silanol group density, or methanol number. Moreover, as with *Barthel*, there is no inherency, as to satisfy the legal requirements for inherency, each and every one of the silicas of *Tojo* must meet the claim requirements. Meeting the claim requirements some of the time or even most of the time is insufficient as a matter of law. Here, there is no indication that the silicas of *Tojo* meet the claim requirements any of the time. Withdrawal of the rejection of the claim over *Tojo* under 35 U.S.C. § 102(b) is respectfully solicited.

Claim 7 has also been rejected under 35 U.S.C. § 103(a) over either of *Barthel* or *Tojo*. Applicants also respectfully traverse these rejections.

It is well established in patent law that in a rejection for obvious subject matter, the reference must teach or suggest Applicants' claimed invention. Neither reference does so.

Applicant's claimed silica is only partly hydrophobicized, and still contains significant surface silanol content, 0.9 to 1.7 SiOH groups per nm<sup>2</sup>. The surface silanol groups of untreated silica may be as high as 2.5 OH/nm<sup>2</sup> (specification, page 4) or higher. Whatever the initial silanol density, partial silylation reduces this density to below the starting concentration, but only to within the range of 0.9 to 1.7 SiOH/nm<sup>2</sup> in Applicants' invention.

*Barthel* does not teach or suggest such silicas. Rather, as stated previously, *Barthel* desires to fully silylate such that no silanol groups remain. Thus, *Barthel* teaches away from the use of partly hydrophobicized silica. Teaching away is strong evidence of non-obviousness. *W.L. Gore v. Garlock*, 220 USPQ 303 (Fed. Cir. 2003). The claimed invention is clearly non-obvious over *Barthel*.

The Office has maintained the rejection over *Barthel* based on the premise that *Barthel*'s process inherently produces partly hydrophobic silica. This is incorrect. *Barthel* is directed only to highly hydrophobic (apolar) silica free of silanol groups. It does not matter, for example, whether *Barthel*'s starting silica is pyrogenic or precipitated silica, *i.e.* the number of silanol groups initially present is immaterial, because *Barthel* teaches selection of an amount of silylating agent which completely silylates all silanol groups such that none or an inconsequential number remain. *Barthel*'s silica product is completely hydrophobicized and completely non-wettable. As he himself states: "The highly apolar silica according to the invention . . . has no water-wettable fractions." *Barthel* at column 8, lines 58, 66. Moreover, the *Barthel* silica has no detectable silanol groups. *Barthel* at column 8, lines 62 - 64.

The Office's position appears to be that out of *Barthel*'s broad disclosures of operating conditions, one might be able to produce a partly hydrophobic silica. Applicants cannot disagree. However, that is not *Barthel*'s invention, nor his teachings. *Barthel*'s wide parameter windows are for the purpose of disclosing, for example, amounts of silylating agent necessary to fully silylate, in other words, fully hydrophobicize the silica, no matter what the starting surface silanol content, no matter what the starting surface area, and no matter whether the silicas have already been surface treated. Regardless of the values of these parameters, *Barthel* completely silylates. This is his only teaching. *Barthel* teaches away from doing what Applicants have done.

Inherency cannot be used as a basis for rejecting claims under 35 U.S.C. § 103. *See, e.g. In re Shetty*, 195 USPQ 753, 757 (CCPA 1977); *In re Naylor*, 152 USPQ 106, 108 (CCPA 1966); *In re Spormann*, 150 USPQ 449, 452 (CCPA 1966). In a rejection for obviousness, it is not enough that one could pick and choose, from among a wide range of choices, parameters which might be successful for duplicating the claimed invention. What is required is direction, *i.e.*, a teaching or suggestion to make those choices to produce the claimed result. *Barthel* does not do so. *Barthel* does not teach selecting an amount of silylating agent which would only partially hydrophobicize silica to result in Applicants'



claimed invention. To the contrary, *Barthel* teaches not selecting such parameters. Rather, *Barthel* teaches only complete silylation.

There are no overlapping ranges here, as mentioned by the Office in page 7 (B) of the Office Action. As indicated by the Examiner, claim 7 is a product claim. *Barthel* discloses none of the product physicochemical properties. There is no overlap. *Barthel* mentions only two of the claimed properties: carbon content and silanol content. With respect to the latter, *Barthel* discloses a silanol content of 0. This is his aim: to eliminate surface silanol groups to increase thickening power in apolar solvents or systems. *See, e.g. Barthel* column 1. There is no overlap between *Barthel's* silanol content and that of Applicants. *Barthel* teaches away from Applicants' silanol content range.

With respect to carbon content, while *Barthel* may teach carbon contents which overlap those of Applicant, this does not mean that his products overlap those of Applicant. Carbon content is only one of five claim limitations. Each limitation must be taught or suggested. Moreover, as shown by the Examples and Comparative Examples in Applicants' last response, silica with the same carbon content can have widely varying hydrophobicities, as shown in the Table below:

Examples	% Hydrophobicizing Agent	Silica Carbon Content	Water Wettable?	Methanol Number
Example 1	4.29 wt. %	0.82	Yes	0
Example 2 (comparative)	4.29 wt. %	0.85	No	45

Thus, even if there is some overlap between certain product parameters<sup>2</sup>, this does not mean that a product within the scope of the claims is produced. *Barthel* expressly teaches away from partly hydrophobicized silicas, requiring fully silylated, fully hydrophobicized silica, with no

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<sup>2</sup> As the Office states, process parameters are not relevant in a product claim.

residual silanol content. Withdrawal of the rejection of claims 7 over *Barthel* under 35 U.S.C. § 103(a) is solicited for these reasons.

The same arguments apply to *Tojo*. *Tojo* nowhere teaches or suggests partial hydrophobicization of silica to produce a produce with Applicants' five claimed silica characteristics. *Tojo* mentions only one of these characteristics, carbon content, and as discussed earlier, carbon content does not dictate the remaining characteristics. Silicas with the same carbon content may vary widely in their hydrophobicity.

The goal of *Tojo* is to produce silane-modified silicas which are compatible with olefin rubber compositions and which improve heat aging. This is accomplished by using functional silanes which contain chloralkyl, chloralkenyl, or alkenyl groups. *Tojo* nowhere teaches or suggests preparation of partly hydrophobic silicas having 0.9 to 1.7 SiOH/nm<sup>2</sup> and a methanol number < 30, or the other requirements of Applicants' claims. If Applicant is wrong, the Office should point with particularity to the relevant teachings. The mere presence of a numerical value is not a teaching. The invention must be considered as a whole, as must also the prior art reference.

It is immaterial that one, by judiciously picking and choosing from among silylating agent, silylating amount, type of silica, silica initial surface silanol content, etc., might obtain values which might result in Applicants' invention. Such picking and choosing is legally improper, unless there is motivation directing the skilled artisan to the particular combination of parameters. *In re Wesslau*, 147 USPQ 391, 393 (CCPA 1965). As stated in *In re Shaffer*, 108 USPQ 326 (CCPA 1956), a reference which does not even mention the problem addressed cannot suggest a solution.

*Tojo* does not mention any of the four claim requirements of contact angle, surface coverage degree, surface silanol density, or methanol number, nor does he teach or suggest any of these. How can this non-disclosure and non-teaching render the subject invention obvious?

Again, the obviousness argument of the Office appears to be based on inherency. However, inherency is immaterial to obviousness. *Shetty, id.* There is no indication that *Tojo* prepared any partly hydrophobic silica meeting Applicants' claim requirements. All the silane treating agents of *Tojo* contain chloralkyl, chloroalkenyl, or alkenyl groups, all of which are quite hydrophobic compared with methyl groups, for example. Moreover, *Tojo* employs a trialkoxysilane, each of which, being tri-functional, can react with three silanol groups. *Tojo* at column 5, first paragraph, indicates that silanol groups are blocked. Applicants do not block all silanol groups, but require their presence.

For example, in Applicants' Example 3 (comparative) recited in the last Response, a trimethoxysilane silylating agent (tri-functional like those of *Tojo*) was used with a silica having the same surface area of *Tojo's* silica of Example 1 (200 m<sup>2</sup>/g). *Tojo's* silica contained 2 weight percent carbon, whereas the Comparative Example 3 referred to above contained only 0.81 weight percent carbon. Despite having less than 50% of the carbon content of *Tojo's* example, the silica containing only 0.81% carbon was still highly hydrophobic, non-water wettable, and had a methanol number of 40, all these being outside the claimed range.


*Tojo* simply does not teach or suggest preparing any silica having Applicants' claimed characteristics. *Tojo* does not direct the skilled artisan to the claimed invention. In the absence of any teaching or suggestion to treat silica so as to partly hydrophobicize the silica, resulting in a silica having Applicants' claimed parameters cited earlier, the rejection of the claims as obvious over *Tojo* must be withdrawn.

Applicants submit that the claims are now in condition for Allowance, and respectfully request a Notice to that effect. If the Examiner believes that further discussion will advance the prosecution of the Application, the Examiner is highly encouraged to telephone Applicants' attorney at the number given below.

Please charge any fees or credit any overpayments as a result of the filing of this paper to our Deposit Account No. 02-3978.

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Date: November 30, 2007

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